The Neuropsychology of Board Games, Puzzles and Quizzes

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A potentially bewildering array of neuropsychological tests exists, examining the various domains of cognitive function, such as intelligence, memory, language, perceptual (especially visuoperceptual) skills, praxis, and executive function. Board games, puzzles, quizzes and other parlour diversions have a number of common features, including being rule bound and subject to the play of chance, and require various degrees of strategy, planning, and flexibility for their execution. Hence, they may be regarded as tapping some of the same functions explored by neuropsychological tests, as examined in the following tentative suggestions. Readers may be able to conjure further examples. Like neuropsychological tests, the diversions are seldom tests of a single function.

Memory
Quizzes are usually tests of semantic (facts) memory. Examples include the board game Trivial Pursuit, the long-running radio programme Brain of Britain, and TV shows such as University Challenge, Mastermind and The Weakest Link. These are essentially testing recall, although the wording of questions may move questions more toward the recognition paradigm (NB the board game Mastermind taps very different cognitive skills). Tests more inclined towards working memory are seldom encountered, although occasional questions in University Challenge, of the "Buzz as soon as you know the answer" type, based on mathematical calculations, do occur. A semantic memory test with a forced choice paradigm is presented in Who wants to be a millionaire, usually 1 of 4, but occasionally 1 of 2 ("50:50"), and recourse to external memory aids is also possible ("Ask the audience" and "Phone a friend").

Visual memory games often revolve around recalling the locations of matching cards or symbols which are only briefly uncovered, or objects shown and then removed (the "tray game"); all may fall under the rubric of Pelmanism. (My personal experience suggests that children are better than this adult at these games.)

Language
Many board games are essentially linguistic in the skills they tap, such as Scrabble and Boggle, where lettered tiles must be used to make words. The latter has a visuospatial element in that letters in the array must be adjacent (vertical, horizontal, or diagonal) to be used to make words, and also there is a fixed time element. The "against the clock" factor for word generation also looms large in the TV show Countdown, where word length earns the points rather than number of words generated. Clearly there is an executive function, as well as linguistic, component to these games, tapping particularly phonemic verbal fluency. Crosswords, depending on their degree of cryptic-ness, probably tax executive function more than simply linguistic skills. The game Articulate taps semantic modules, requiring words to be conveyed by giving their meanings.

Games involving numerical calculation might be included here, since numbers are a form of language. Certain card games are based on addition (Pontoon, Cribbage). In one form of dominoes, matching of the two end tiles to be multiples of 3 and 5 is the basis of scoring in the game (cf. below). Sudoku obviously tests numerical as well as spatial functions.

Perceptual (especially visuoperceptual) skills
Snap is a classic game of simple visual matching, amenable to even very young children. In one form of dominoes, matching of spots and getting rid of your tiles are the sole objects of the game (cf. above), as in variants such as Triominoes. Card games such as Rummy and Patience and even Poker require visual matching, to collect cards with like characterisitics, combined with executive function, with rather more complex rules than snap. Any game involving trumps may also share these cognitive demands.

Visual recognition lies at the heart of Wordsearch puzzles, with visual scanning of an array of letters in search of salience (word recognition). Likewise games such as charades probe visual recognition skills (older readers may recall that this was televised as Star Turn on BBC children's TV, before the format was ripped off by ITV as Give Us A Clue). Pictionary also taxes visual recognition skills. Jigsaw puzzles require matching of visual patterns and colours, but also sometimes shape (e.g. edges, large areas of monochrome sky or grass). Playstation and DS are alleged by some to promote visual/manual coordination.

Praxis
Testing of acquired skilled motor movements seems less profitable as a theme for parlour games, as compared to other domains. One might argue that Jenga and Buckaroo are all about fine motor control.

Executive function
As mentioned, executive function plays a part in many of the games already alluded to. Whereas the throw of the dice determines everything in Snakes & Ladders (truly, alea jacta est!) and largely so in Frustration or Sorry, greater cognitive demands are imposed in dice games such as Monopoly and Careers (in what proportions do you choose to pursue fame, happiness or fortune?), in which strategy (as well as luck) is important. Cluedo requires information to be pursued and inferences to be made.

Conclusions
In light of these considerations, it may be worth asking patients and carers about facility, or loss thereof, in playing board games and doing puzzles as one element of history taking in the cognitive clinic. However, it must be borne in mind that some games seem largely bereft of all intellectual function: it is hard to see what cognitive functions are tapped in deciding in which order to open a set of boxes (Deal No Deal).

Examination of the ability to play games effectively lies at the heart of some existing cognitive tests, such as Wisconsin Card Sorting and tests of gambling such as the Iowa Gambling Task and the Cambridge Gamble Task. Might Monopoly, cards, charades, etc be introduced to the cognitive clinic? Patients might find them less daunting than unfamiliar neuropsychological tests, and it might add some fun to consultations. A loss of enjoyment in such innocent diversions might also be indicative of cognitive disorders with frontal lobe involvement. ◆